PATENT COOPERATION TREA

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference p200494	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/10854	International filing date *(day/month/year)* 30.09.2003	Priority date *(day/month/year)* 30.09.2002
International Patent Classification (IPC) or both national classification and IPC C08F110/06		
Applicant BOREALIS POLYMERS OY		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the International application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08.04.2004	18.04.2005
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/10854

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-26 as originally filed

Claims, Numbers

1-35 received on 02.03.2005 with letter of 28.02.2005

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4,9,12,14,16,26,27,29-32.
	No:	Claims	1-3,5-8,10,11,13,15,17,18-25,28,33-35.
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-35.
Industrial applicability (IA)	Yes:	Claims	1-35.
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item I

Basis of the opinion

1. Claims 1, 3,4 and 5: (i) the amendment to "aluminium compound" is not allowable since it goes beyond the disclosure in the application as originally filed as any alumium compounds are now possible (Art 34 PCT). The description mentions an aluminium alkyl compound with n = 0,1,2 or 3, so the only amendment possible here would have been to an aluminium akyl with n = 0-2 since this is the only option that leaves no ambiguities and is therefore also obvious.
The report has been established as if this amendment had not been made. (R. 70.2 (c) PCT).

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

I. The following documents (D1-D5) will be referred:

D1: US-A-4 294 948 (TOYOTA AKINORI ET AL) 13 October 1981 (1981-10-13)
D2: US-A-5 413 979 (GUSTAFSSON BILL ET AL) 9 May 1995 (1995-05-09)
D3: WO 00 08074 A (BOREALIS AS ;GAROFF THOMAS (FI); LEINONEN TIMO (FI); ALA HUIKKU SI) 17 February 2000 (2000-02-17)
D4: US-A-5 409 875 (HSU CHENG C ET AL) 25 April 1995 (1995-04-25)
D5: US-A-4 845 177 (VOGT HEINZ ET AL) 4 July 1989 (1989-07-04)

1. D1 US4294948 describes the following preparation of an olefin polymerisation catalyst, the parentheses delimiting individual steps:
(MgCl + ethylbenzoate (internal electron donor (IED)) + silicone oil (which according to D3 (p.20 ,l .35-p.22,l.36) modulates particle size) or kerosene, ball milled together at an unknown temperature (presumably room temperature))+ ethanol, which is then suspended in kerosene (a C10-C16 hydrocarbon mixture)+ p-cresol + Et2AlCl (or iBu3Al or Et3Al) added with stirring at 50°C for 2 or 5 h followed by collection of the solid by filtration and washing with hexane. This solid is then treated at 110°C with 200ml liquid $TiCl_{3.9}(OEt)_{0.1}$ with no other solvent present. The solid is subsequently filtered and washed with hexane. D1 is silent with respect to the Al content in the final product. Propylene is polymerised in the presence of this catalyst plus ethyl or methyl toluate and Et3Al as cocatalyst. (see p.9-

18, eg 1 in conjunction with eg 9, egs 10,11 and 14, tables 4-6). Hence claims 1-3,5-7,10,11,13,15,17,18-25,28,33-35 are not novel and reference is made here to the very serious objections under Box VIII, and also particularly to Box VIII, point 16 which do not allow the present subject-matter to be distinguished from the disclosures in D1 for these claims.

2. D2 describes in eg 1 the following: dried silanated silica agitated at 80°C for 1 h with (0.75 g MgCl2 dissolved in ethyl acetate (IED)), dried to a free flowing powder. This is then slurried in heptane and 3.5 ml 10 wt% Et3Al added in pentane followed by agitation for 1 h at 40°C. Then 0.32 ml TiCl4 is added and the whole agitated at 60°C for 2 h. The whole is then dried at 100°C under a N2 flow. There is no subsequent washing. The final Al content is 1.5%. This composition is used in conjunction with Et3Al as cocatalyst for ethylene polymerisation (see eg 1). Hence claims 1-3,5-8,13,15,17,18-25,28,33-35 are not novel and reference is made here to the very serious objections under Box VIII, and also particularly to Box VIII, point 16 which do not allow the present subject-matter to be distinguished from the disclosures in D1 for these claims.

In light of the fact that in each of the following cases no technical effect has been demonstrated over D1:

3. It is trivial to reduce the Al content from 1.5 to 1.0%, hence claim 4 is not inventive.

4. It is trivial to replace a hydrocarbon such as heptane with another such as toluene, hence claim 9 is not inventive.

5. It is trivial to replace an IED such as ethylbenzoate with another such as dioctyl phthalate, which is standard in the art (see D3, which resides in the same present technical field, p.20 ,l .35-p.22,l.36), hence claim 12 is not inventive.

6. 5. It is trivial to reduce the temperature at which the IED is combined with the magnesium reagent from 80°C (D2) to 70°C, hence claim 14 is not inventive.

7. It is trivial to repeat the procedure of claim 1 on substituting the titanium element by other potential transition metal catalysts, hence claim 16 is not inventive.

8. Surfactants are not disclosed in either D1 or D2, but their use as emulsion stabilisers is standard in the art, and D4, which resides in the same present technical field, discloses an ethylene acrylate support (col. 6, eg 1), hence claims 26 and 27 are not inventive.

9. The polymeric compounds of claim 31 ("turbulence minimising agents") are not disclosed in either D1 or D2, but the employment of small amounts of polymers such as 2 wt. % (20 000 ppm) polyisobutylene as dispersants is known in the art for precisely the

same type of mixing process (see D5, which resides in the same present technical field, eg 1: SiO2+TiCl3+acetone (ED)+MgCl2 + polybutylene dispersant), hence claims 29-32 are not inventive.

Re Item VII

Certain defects in the international application

1. The nature of the "Viscoplex 2" used in the examples has not been defined.

Re Item VIII

Certain observations on the international application

The following objections are made under Art. 6 (PCT):

1. Claim 1: (i) "precursor thereof": is this meant to be the precursor to the metal or the electron donor? The structure of the claim in English means this refers unequivocally to the electron donor, but the art generally refers to metal precursors, not electron donor precursors. In any case, such a precursor may not be readily identifiable (see point 6 below for further elucidation in other applicable cases).
(ii) " to produce an emulsion...", "the dispersed phase of which contains more than 50 mol%..." and "in order to maintain..." are terms which attempt to define the invention in terms of a "result to be achieved": neither the nature of the combinations of solutions and the concentrations thereof required to produce such an emulsion, nor the conditions needed to give rise to 5-200 um droplets are known. This is inadmissible (PCT GL Ch.-III,4.7). The claim should have been defined in terms of all the essential features necessary to carry out the invention, including the nature of the solvent: if for example, aromatic hydrocarbon solvents such as toluene function whereas aliphatic ones such as heptane do not, then this should be specified in the claim as an essential feature. All the "results to be achieved", defined here and in later claims, should have been replaced by essential features necessary for defining the invention. Regardless of the present examples, the claims have to be clear in their own right.
(iii) the "droplets" have not been predefined in the claim, so one can only guess what they might be, irrespective of the fact that "droplets" here implies a liquid, such as oil, dispersed in another immiscible liquid, such as water (droplet, by definition, means "very small drop of liquid" (see the Concise Oxford English Dictionary)). In any case the second immiscible

medium has not been defined.
(iv) "solidifying" is unclear as it implies a physical intervention on the part of the skilled man for this to occur, whereas present example 1 implies that the formation of solid particles from the emulsion itself is the result of the formation of a new solid product resulting from the interaction of the previously liquid reagents. This generates an ambiguity. Moreover, regardless of the present examples, the claims have to be clear in their own right.
(v) "n" cannot be 3, as this would define AlX3, which is not an aluminium alkyl. "n" = 0-2 should have been specified (p. 5, l.6-13). This objection remains (see Box I)
(vi) the aluminium alkyl must necessarily be added in step c), as this is the only point where the necessarily present droplets have been defined. These droplets are the point of reference here, and are to be distinguished in step d) from the solids resulting therefrom. Droplet, by definition, means "very small drop of liquid" (see the Concise Oxford English Dictionary). A process has been defined in which the aluminium compound is brought into contact with the droplets and the droplets alone: not the solids. This, by definition, can therefore only refer to step c).

2. Claim 2: the terms "emulsion stabiliser" "turbulence minimizing agent" is meaningless as they have not been defined with respect to a point of reference. Thus one cannot identify what reagents will necessarily fall under these categories. The claims must be clear in their own right.

3. Claim 3: point 1 (vi) also applies here.

4. Claim 4: Points 1 (v) and (vi) also apply here.

5. Claim 5: Points 1 (v) also applies here.

6. Claim 11 in conjunction with claim 1 attempts to define the process of claim 1 which employs a carboxylic acid ester *product* prepared according to the process of claim 11. It cannot be ascertained that such an acid ester was prepared in this way: this is not the only way that the esters of claim 10 can be prepared and once the synthons have been consumed in the preparation, there will no longer be any evidence of their existence. The claim should be redrafted as a pure process claim comprising the preparative steps of producing said acid ester. The claims must be clear in their own right.

7. Claim 23: (i) "insoluble oil" has not been previously defined. Moreover, insoluble in what? Furthermore, this is a "result to be achieved", which is inadmissible (PCT GL Ch.-III,4.7).
(ii) "Group IV metal" must be the previously defined TiCl4, as this is the only group IV metal mentioned in this claim. "..which is a toluene/TiCl4-insoluble-oi" (emphasis added) means exactly that and nothing else: it cannot be interpretated as comprising a toluene/TiCl4-insoluble-oil. Irrespective of claim 1 on which it depends which mentions transition metals in general, claim 23 must be internally consistent.
(iii) the "less dense" oil is a "result to be achieved", which is inadmissible (PCT GL Ch.-III,4.7): "composed of" implies a product wherein the presence of two different oils of differing densities cannot necessarily be ascertained. The formulation of two phases can only be constructed within the framework of an addition of two different "oils" in separate process steps.

8. Claims 26 and 27: the term "surfactant" is unclear, as it has not been defined with respect to a point of reference: what may be commonly regarded as a surfactant in aqueous systems may have no such property in an organic solvent. "www.wikipedia.com" under the keyword "emulsion" supports this by referring to many different systems in which the surfactant is defined as such according to its function in a specific system. Thus what may be called a surfactant in one system, cannot be called so in another.

9. Claim 28: (i) points 1 (iv) and 2 above apply.
(ii) "said TMA being inert and soluble..." is a result to be achieved because whether the TMA is inert and soluble will depend on its nature as well as on the conditions employed and the nature of the components with which it is used. This is inadmissible (PCT GL Ch.-III,4.7).

10. Claim 29: (i) point 2 above applies.

11. Claims 30 and 31: it cannot necessarily be ascertained that such a polymer originated from the monomers specified in these claims: one cannot necessarily ascertain from a polymer what the original monomer unit building blocks may have been if the repeat units in the polymer originate from monomers exhibiting no recognisable start and end groups in the polymer derived from them. This reasoning applies to points 12 and 13 below, namely that in these "product by process"-type claims building blocks cannot be used to define a

product produced therefrom if the building blocks, as the result of their interaction in producing the product, have been changed such that there nature is no longer derivable by analysing the product.

12. Claims 33 and 34: this is a claim for a product obtained by a process. It cannot be ascertained in the final product that this material had been produced in this way.

13. Claim 35: this claim attempts to define a process ("use of a catalyst..") employing a catalyst product which is itself produced by a process. It cannot be ascertained in the final product that this material had been produced in this way.

14. Claims 2,3,8,15,16,18,25 and 31 do not appear to be supported in their entirety by the description.

15. The term "preferably" used in several claims is vague.

16.The subject matter related to the above-mentioned objections will be ignored with respect to the objections under Box V above, since being unclear, it cannot be considered limiting for the scope of the claims.